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2020

No May Club Meeting

Due to COVID-19 rules on gatherings

Socialize on the airwaves instead



Even the best antenna system still deals with propagation phenomena

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NEVARC NEWS ITEMS

Due to COVID-19, all future club physical meetings are cancelled.
The club website has been updated to inform of this.

As per our constitution, we can hold meetings electronically.
In light of this, I am going to rebuild the conference server we once had, and put an external phone number to it, so that we can hold meetings as required.

I'll email out details when I get it sorted.

I was hoping I was going to get told to stay home from work and finish an array of projects, but I'm not that lucky. We have been as busy as ever at work.

If anyone wants to make youtube videos of what they've been playing with, Mick or I can put them up in the news section of the website for everyone to see.

As we have a great member base here in the club, during these trying times, if anyone needs anything, even if it is just an ear to chat in, don't be afraid to reach out to the other club members. Everyone's mental health is important.

Repeaters:

VK2RWD 2M is getting huge reports in from Shepparton to Griffith, and its full quieting in places it was patchy, and I was able to access it just north of Myrtleford. Evidentially the new cavities have done it huge favours.

VK3RWO is going well with its new batteries.

There is a bit of noise on the receiver I want to look at, but that is going to have to wait until after all this COVID-19 rubbish is over.

The next upgrade is going to have to be digital/analogue.

VK3RWC is working well for what it is.

The new cavities appear to have given it a bit more sensitivity, where it can hear the sub tone long before the audio path opens up. It is keyable from nth Barnawartha.

It does spend a lot of time linked to VK3RWO thanks to Tim, VK3MIT.

I have noticed recently that there is an audio problem somewhere on the link.

I think it's at the Wodonga end. Something more for me to put on the to do list.

VK2RWD 6M. Nothing new to report here, it is still operational when the sun goes down, not a very big footprint at the moment, but it is working.

It is connected one way to VK3RWO 2M (and VK3RWC).

So if you feel like experimenting, you can at least listen to it on 3RWO.

During the evening, I can connect both ways if someone sends me an email.

It is connected only one way to prevent F calls inadvertently ending up on 6M.

RASA has applied for, and got a special event callsign.

For the love of it, I cannot understand why they think COVID-19 is a special event, but none the less, they have obtained: **VI2020STAYHOME**

Keep an ear out on the HF bands. You may hear them.

Matt, VK3SMB, on behalf of Gary, VK2VU

WHAT IS PROPAGATION?

The term PROPAGATION is used to describe how the transmitted signal reaches the receiving station or target area.

The ways signals reach the receiving station are governed mainly by distance and frequency. That is an over simplification, but this article is designed to be an introduction, rather than an in depth explanation of every mode and variation of propagation phenomena.

Other major players affecting MF/HF propagation are the 11 year solar cycle, time of year, day-to-day solar activity and time of day. For VHF (i.e. frequencies above 30MHz) the picture is somewhat different with the weather conditions and the state of the lower atmosphere playing a major role in determining if a station can be contacted.

Other things affecting longer distance propagation on VHF are solar activity and location of both transmitting and receiving stations. Best distance under normal conditions can be obtained if there is an unobstructed salt water path between both stations.

WHAT ARE THE LAYERS OF THE ATMOSPHERE?

The ATMOSPHERE, the envelope of gases that surround the earth is comprised of many different layers, each having an effect on the propagation of radio waves. The atmosphere varies in density, being most dense near the earth's surface and becoming less and less dense as height above the earth increases. Temperature in the atmosphere also varies with height with the rate of change is fairly constant.

The portion of the atmosphere where the temperature reduction is fairly constant with height is called the TROPOSPHERE.

The troposphere extends from the surface of the earth up to a height of 10km or so. This is the part of the atmosphere that contains the right mixture of gases to support life and is also responsible for our weather.

The point at which the temperature stabilizes is called the TROPOPAUSE and is to be found at around 10-20km above the earth's surface. From the tropopause to about 60km up we find the STRATOSPHERE.

This is the part of the atmosphere where aircraft fly as the air is thinner and hence there is less friction and drag, allowing the aircraft to fly faster and use less fuel. Temperature is fairly constant but does tend to actually increase as the top of the stratosphere is reached (the STRATOPAUSE). The next layers form the IONOSPHERE, perhaps the amateurs greatest asset, perhaps also his worst enemy!

WHAT IS THE IONOSPHERE?

The IONOSPHERE is comprised of several layers of gas located from 70 to 650km (approx) above the earths surface.

These layers can combine, split or change their characteristics which makes forecasting conditions a bit of a hit and miss affair.

Some properties of the ionosphere are well known and can be predicted with a fair degree of accuracy, whereas others are totally unpredictable.

The ionosphere is split into several layers, each of which has been assigned an identifying letter to, hopefully, ease confusion. Starting at the lowest level, we have the D layer/region, next is the E layer, then the F layers (which are split into F1 and F2).

All of these layers/regions have unique properties and each either aids or hinders our efforts to propagate a signal.

WHAT IS THE D REGION?

The D REGION is the lowest layer of the ionosphere, extending from about 60km to 100km above the earth's surface.

The reason that this area is called a 'region' instead of a 'layer' is that it is only really present during daylight (the time that the sun is illuminating the ionosphere, which is considerably longer than terrestrial daylight). At night the D region virtually disappears allowing signals to pass through to the higher levels of the ionosphere where they will be refracted back to earth (often the term used is reflected, but refracted is the correct description).

The D region affects the lower frequencies and is the reason why signals on MW and 160m are confined to a few 10's to maybe a couple of hundred km during daylight hours.

While the sun is illuminating the ionosphere, the D region is highly ionised and acts like an RF 'sponge' to MF signals.

As the sun sets, the D region becomes less and less ionised and almost disappears, the remaining ionised molecules are spread so thinly as to make little difference to the signal passing through.

WHAT IS THE MYSTERIOUS 'E' LAYER?

The E LAYER of the ionosphere is the stuff of radio legends, fantastic feats and has puzzled scientists for as long as they have known about it's existence!

Way back in 1902 (just after the 'birth' of radio) 2 physicists, one based either side of the Atlantic, first put forward the idea of there being an ionised layer in the atmosphere. The two were called Arthur Kennelly (USA) and Oliver Heaviside (UK), hence the old term for the E layer, the "Kennelly-Heaviside Layer".

Edward Appleton carried out experiments during 1924 to confirm not only the existence of the Kennelly-Heaviside layer, but that in fact there was at least one other layer above it.

Appleton was the first person to refer to the Kennelly-Heaviside layer by it's now common name, the E-layer. He named it the E layer because, he considered, it reflected the "electric" field of the radio wave.

The layer above this he named the F-layer.

The F-layer is sometimes still referred to as the "Appleton Layer". Subsequently another layer, below the E layer, was discovered by Robert Watson-Wyatt, and designated the D layer (or region, for the reasons described previously).

The E layer is located around 100-130km above the earth's surface and the air density is still quite high, allowing the recombination of molecules (ionisation) to take place easily. As the sun illuminating the ionosphere causes ionisation, the ionosphere is most ionised at local midday. After sunset, ionisation rapidly falls off until it has all but ceased.

WHAT ARE THE 'F' LAYERS?

As Appleton had discovered, there is another layer above the E layer which he named the F-layer.

What he didn't realise is that the story is not quite that simple and the F-layer is in fact comprised of 2 layers that recombine at night (so can one assume he did his experiments at night?).

To differentiate these layers, they were identified as F1 and F2.

The F1 is the lower of the two and is to be found at heights of 150-250km. The higher F2 layer extends from about 300-500km or so. As stated, these heights are only valid during daylight.

At night, the layers combine and form a single layer at a height of about 250-350km. These heights vary according to time of year, the solar cycle and latitude. Because the F layers are the only ones that are present in some form 24 hours a day, they are considered to be the most important part of the ionosphere as far as radio communications are concerned.

WHAT DOES THE TERM “CRITICAL FREQUENCY” MEAN?

The CRITICAL FREQUENCY is the highest frequency that will be returned to earth when the wave is radiated vertically (this is very different to being VERTICALLY POLARISED) towards the ionosphere.

Once the critical frequency is passed, the radio wave will not be returned to earth and will travel out into space. When listening to propagation forecasts, the term “F2 DAYTIME CRITICAL FREQUENCY” will be heard. What this means is that the frequency stated is the highest frequency that the F2 layer will return to earth during daylight (as the F2 layer ceases to exist during darkness).

When written, the symbol for critical frequency is ‘ f_0 ’. Sometimes the critical frequency is measured against the E layer instead of the usual F layer.

The symbol used to denote an E layer critical frequency is ‘ f_{0E} ’.

The f_{0E} is usually around 2-4MHz, depending on time of day, year and solar cycle.

WHAT DOES THE ABBREVIATION “MUF” STAND FOR?

The term “MUF” is used a lot in radio communications and stands for “MAXIMUM USABLE FREQUENCY”.

As we have just seen, when a radio wave is transmitted vertically, it will not be reflected back to earth above a certain frequency.

If the angle of the radiated wave is changed from vertical to something nearer horizontal, the frequency at which it will be reflected increases significantly.

To calculate roughly the MUF, multiply the F2 critical frequency by 2.15. The MUF, however, varies considerably dependent on the location of the transmitting station and the path attempted. The path with the highest MUF from the UK tends to be towards South America, which is why South Americans are often the last stations to fade out on the HF bands before they close for the night.

It is an extremely useful thing to know the MUF of a given path as the maximum chance of working a station is obtained from using the band that is closest in frequency to the MUF (check beacons in the part of the world you are interested in to see the highest band they can be received on).

A strange thing is that you may be able to hear loud signals from the desired location but cannot make contact. If this happens (and it will!), try switching to the next band up. Signals may be much weaker, but you will be surprised that more often than not you will be able to make the contact without problem.

As signals are weaker, this is a sure sign that you are near the edge of the MUF and exploiting this fact will provide many more contacts with far off places than using the lower band, despite the stronger signal levels on the lower band.

This is using the MUF to your advantage.

If you are interested in working DX, it is advisable to obtain one of the excellent propagation prediction programs that available.

Most are freeware or shareware and provide good results. A word of warning though, don’t take the results from these programs as gospel, as day to day variations can throw a spanner in the works. If you need to input solar data (as some require), try to obtain monthly average figures as they will give a much more accurate result.

Making best use of the MUF can give surprising results and if you are restricted to low power (say 10w, as the foundation licensees are) or poor antennas, this is often the only way to compete with the big guns. Operating skill plays a part, but using the available resources such as knowing the MUF and how the bands react during the course of the day, month, year etc. will be even more valuable.

WHAT IS THE ANGLE OF RADIATION AND WHY IS IT IMPORTANT?

As discussed earlier, if a radio wave leaves the transmitter at an angle less than vertical, it will be reflected back to earth at a higher frequency. Also it will be reflected back at a distance from the transmitter. This is obviously a vital fact if we want to contact someone who is some distance from the transmitting site.

At high angles of radiation, signals will be reflected back down at a short distance from the transmitter. As this angle is decreased towards the horizontal, so the distance covered by the reflected wave increases. The angle at which the radio wave leaves the transmitting antenna is known as the 'ANGLE OF RADIATION'.

As the radiation angle is reduced, so the distance covered by each reflection increases, hence the need for an antenna with a low radiation angle when trying to work long distances on the HF bands. The angle that the transmitted wave hits the ionosphere is known as the ANGLE OF INCIDENCE, and can be different to the angle of radiation (due to anomalies in the atmosphere before it reaches the ionosphere).

If you are interested in working long distances, then you would equip your station with a low angle antenna (such as a well grounded vertical or a high multi element beam type antenna). If, however, your interests lie in shorter distances then a low dipole would be a better option as it will have a much higher radiation angle than a beam, vertical or high dipole.

I am talking of heights with respect to wavelength rather than physical height in metres.

A low dipole on 80 would be anything less than about 60 feet, whereas a yagi for 10m would be considered to be high if it were located at the same height.

If you are looking to work long distances on 80m (and 40m for that matter), very few people are able to erect a dipole at sufficient height (120 feet would be a minimum to negate effects from the ground), so a vertical is a much better alternative. It should be borne in mind that in order for a vertical to have a low angle of radiation an extensive radial system needs to be employed.

WHAT ARE N.V.I.S., GROUNDWAVE AND SKYWAVE?

N.V.I.S. is the acronym for Near Vertical Incidence Skywave (or 'cloudwarming' as it has become known amongst us radio folk). NVIS is the art of sending a nearly vertical radio wave up into the ionosphere, so that it may be reflected back at a short distance from the transmitter.

It is particularly useful at low frequencies to cover the "SKIP ZONE", the area that is longer than the distance covered by GROUNDWAVE, but shorter than the first normal reflection (or hop) from the ionosphere. The groundwave is the part of the signal that travels along the surface of the earth to the receiver. The strength of the groundwave is inversely proportional to frequency, being strongest at low frequencies.

As frequency is increased, the distance covered by the groundwave decreases.

Local MW stations rely on the properties of groundwave propagation to reach the target audience. As the range of a MW groundwave signal is limited to a 100 or so km during daylight, stations that are geographically separated by 200km or so can operate on the same frequency without causing interference to each other (in theory!).

The SKYWAVE is the part of the signal that is sent skywards and is reflected from the troposphere with the SPACEWAVE (not a term in common use these days) being the part that is reflected from the ionosphere.

The Skywave is now taken to mean any signal other than the groundwave. As the D layer disappears at night, MW signals from the continent and further afield can be heard as they are being propagated by skywave. Normally skywave signals on MW would not be heard during daylight as the D region would absorb the signals like an RF sponge.

Stations that are within the skip zone cannot be heard as there is no method of getting the signal to the receiver. NVIS is a relatively new technique to try and get signals into the skip zone.

By sending a nearly vertical wave to the ionosphere and near, but not above, the critical frequency, it should be possible to get a signal to reflect into the skip zone.

WHAT IS MEANT BY 'MULTI HOP'

As we have seen, signals can be reflected off the ionosphere back to earth at a distance governed by the angles of radiation and incidence and by the frequency in use. The maximum distance that can be covered in a single 'hop' as it is known is about 4500km.

So how can we hear signals from 15000km?

The answer lies in the ionosphere (as usual), each time a signal is reflected back to earth, some of the signal is bounced back to the ionosphere.

The type of terrain the signal meets when it reaches earth determines how much will be reflected back to the ionosphere.

Salt water is one of the best reflectors as far as this is concerned, so a signal that hits salt water (i.e. the sea or ocean) will suffer much less attenuation than a signal that bounces from a dry desert.

Each time a signal bounces it loses some of its strength and eventually can become so weak that it is no longer detectable.

When the signal enters the ionosphere it also suffers attenuation due to the friction (and hence heat) of the radio wave vibrating ionised molecules.

Other strange effects can take place in the ionosphere and the signal may travel a considerable distance within the ionosphere itself before returning to earth, so predicting where a radio wave will return is a bit hit and miss!

The term 'MULTIHOP' describes the action of a radio wave bouncing back into the ionosphere and subsequently being returned to earth more than once. To traverse the distance between here and Australia would take 4-5 hops, or more if the signal was being propagated the other way 'LONG PATH'.

Another way signals can be propagated is via 'CHORDAL HOP', which is where the signal bounces from the upper ionosphere without sufficient strength to return to earth. The signal becomes 'trapped' between the lower and upper levels of the ionosphere and bounces, or hops, within the ionosphere. Eventually, the signal strikes the upper layers at an angle sufficient to allow it penetrate the lower levels of the ionosphere and return to earth. The advantage of chordal hopping is that the signal suffers much less attenuation than if it were to return to earth each time before bouncing to the higher ionospheric levels.

WHAT IS 'SHORT PATH' AND 'LONG PATH'?

When a radio wave is propagated to a distant place, it travels in a theoretically straight line (the shortest distance between two points is a straight line). Now with the earth being a sphere, normal maps (with the Mercator projection) will give you false information as to how the radio wave reaches its target.

To get the true picture you need to look at a globe or a special type of map called a 'GREAT CIRCLE', which is a representation of the globe if it were flattened onto a piece of paper.

The signals are propagated to the desired location by beaming your signals 180 degrees from the normal heading. The signals can be stronger at certain times of the day when propagated via long path. Sometimes long path is the only path that has an MUF high enough to support communication to the desired location.

When using an omni directional antenna, such as a vertical or low dipole, signals can be received from both short and long path simultaneously, which can lead to confusion at the receiver as there will be a noticeable echo on the signal (the long path signal has travelled considerably further so takes longer to reach the receiver). This echo is only a few 10's of milliseconds but can play havoc with CW reception as the spaces between characters can be filled in with characters from the echo signal rendering the signal almost unreadable. The echo length varies in proportion to the distance travelled.

A directional antenna, with the ability to rotate would make life a lot easier!!

WHAT IS THE 'GREYLINE'?

The GREYLINE terminator is the imaginary line drawn on a map to show daylight and darkness. The greyline is very important for radio communications and is another thing in our weaponry that we can use to get our signal to the desired location. As darkness falls, we enter the twilight zone, where it is not really light, but it isn't completely dark either. When the stations at both ends of the path are near darkness, signal levels often increase for the period that both stations are in twilight.

Often this is the ONLY time contact can be made between stations on a given band. Typically this affects lower bands more (160-40m) but there is increasing evidence that using the greyline can be advantageous on all HF bands.

This 'window of opportunity' only exists for a short time, especially on the lowest frequencies before absorption increases to such a level that the signal cannot penetrate the D layer (which is now building in strength as the path comes into daylight).

On 160m (1.8MHz), the window can be as little as 20 mins or even less.

If you are looking to work the other side of the world on 160m, you need to be prepared as a few minutes either way can mean the path being closed. Greyline paths are not open every day, as you need suitable propagation conditions to the intended target.

The best times to try this path is around the equinoxes (March and September) and at dawn or dusk.

The signals should be getting stronger as we head down to the bottom of the 11 year cycle but it's still not an easy task to get your signal through although it is possible with a little luck and a lot of perseverance.

WHAT IS THE S.F.I.?

SFI stands for SOLAR FLUX INDEX.

The SFI is a figure derived from the number of active sunspots visible on the face of the sun based on observations of thermal and radio noise received at a wavelength of 10.7cm. (2.8GHz) at an observatory in British Columbia, Canada. The thermal noise is related directly to the amount of plasma trapped in the magnetic field that overlie the active regions of the sun, which in turn is related to the amount of magnetic flux (the lines of force generated by a magnet) generated by these active regions.

WHAT ARE SUNSPOTS?

A SUNSPOT is an area of intense magnetic activity on the surface of the sun which is cooler than the rest of the sun's surface. Because it is cooler, a sunspot is darker and therefore visible against the hotter, brighter background. Some sunspot clusters are so large they can be seen without magnification. The next sentence is extremely important and must be adhered to at all times when observing the sun.

NEVER LOOK DIRECTLY AT THE SUN, ALWAYS PROJECT THE SOLAR IMAGE ONTO A PIECE OF CARD WHEN MAKING OBSERVATIONS. FAILURE TO DO THIS CAN RESULT IN PERMANENT BLINDNESS.

There are filters on the market that supposedly make it safe to look at the sun directly - don't trust them! If you value your eyesight, you will never look at the sun directly.

Another advantage of projecting the sun onto a card is that the image can be magnified, making the identification of sunspots easy. Sunspots are a vital part of long distance radio communications as they tied to the ionisation level of the F layer.

The more active sunspot groups, the higher the magnetic and ultraviolet radiation from the sun and the higher the SFI.

If a graph were plotted of daily sunspot numbers, it would be rather spiky and difficult to interpret over time, so a method of averaging is used, called 'smoothing', which gives us the SMOOTHED SUNSPOT NUMBER or SSN.

In the years where there are few or no sunspots, radio propagation on the higher bands can be non-existent. However all is not lost as the lower frequency bands tend to improve as solar activity declines.

WHAT IS THE SOLAR CYCLE?

Every 11 years or so the sun goes through a complete cycle of events.

At the beginning of a new cycle, the first sunspots are noticed on the otherwise blank solar disc. This first batch of sunspots heralds the gradual improvement in the higher HF bands. At the very bottom of the cycle, where few or no sunspots are visible, the bands from 21MHz up can be dead for weeks on end.

Except for some localised ionisation during the summer which supports inter-Europe contacts, virtually no signals will be heard.

Trying to work long distances during sunspot minima on 15 or 10m is a thankless task! Over the next 4 or 5 years, more and more sunspot groups become active.

As more groups are active, so geomagnetic levels in the sun rise and the ionosphere becomes increasingly ionised, leading to an increase in the MUF and hence better conditions on the higher bands.

The term solar activity refers to a combination of the amount of sunspots and also the effect the solar geomagnetic activity has on the earth's magnetic field. At sunspot maxima, solar activity is generally high (or active) due to the increase in sunspot activity and at sunspot minima, solar activity tends to be at low (or quiet) levels.

WHAT ARE THE A AND K INDEX?

The explanation of the solar cycle is based on 'smoothed' figures, that is the average figures for each month are used rather than using daily figures. The reason for this is to give a more accurate picture than using daily figures would. Day to day solar activity can vary dramatically, so using these figures for propagation prediction can lead to unsatisfactory results. As well as variations in the geomagnetic flux, there are two other measurements of the magnetic field activity (caused by interactions of the solar wind the magnetosphere and the ionosphere) that are used in predictions.

These are the A AND K INDICES. The K index is a 3 hourly reading of the magnetic activity compared to a standard 'quiet' day taken at various observatories. This index was first introduced by J. Bartels back in 1938 and consists of a single number in the range 0-9. The planetary K index (Kp) is the mean or average index of readings from 13 observatories located between 44 and 60 degrees latitude each side of the equator. The planetary index measures solar particle radiation by its magnetic effects. The A index relates to geomagnetic stability and is derived from the K indices of the previous day. The Planetary A index (Ap), is derived from the A indices of the world wide network of magnetometers.

WHAT IS A SOLAR FLARE/GEOMAGNETIC STORM?

As mentioned above, the A and K indices give us a good indicator to propagation conditions. As the index increases so geomagnetic activity increases until a level is reached that has been classified as storm level. A solar storm occurs when nuclear fission within the sun reaches such a high level that matter is ejected outwards from the sun, towards the earth.

The most common of these is the SOLAR FLARE, many of which occur during the course of a year. These flares range in intensity from mild to severe. The strength of a solar flare (X-ray flux) is measured by the GOES spacecraft and is denoted by a letter and number system. The strength ranges from the weakest, A, through B, C and M to the most severe, X. Within these classes, a further subdivision using a numeric system is made ranging up to 9, so the most severe flare would be classed as an X9 event.

Thankfully there are few of these during an 11 year cycle.

A flare is considered significant if it rises above M levels. To put a solar flare into context, large flares can emit 10 million times the energy that is released by a volcanic eruption. Such an intense release of energy not only disrupts earthly communications but it can also cause damage to satellite control systems as they do not have the benefit of an atmosphere to dampen the force of the shock wave. A solar flare travels at such speed that within 10 minutes or so of eruption it can reach the earth's atmosphere causing short-lived radio blackouts on the sunlit side of the earth.

A prominent solar flare on the South East of the solar disc, as seen by a soft X-ray telescope.

WHAT IS A CME?

Another common result of excess nuclear activity within the sun is the CME or CORONAL MASS EJECTION.

A CME is an explosion within the sun that causes large amounts of solar matter to be ejected into space.

This ejection causes a 'shock wave' of magnetic disturbance to head towards earth. When the shock wave hits the ionosphere it disturbs the earth's magnetic field to such an extent that some of the electrons in the field can be lost to the shockwave.

This disturbance to the magnetic field shows up as a rapid increase in the A and K indices.

With electrons missing, the ionosphere loses ionisation, the MUF falls and absorption can increase to such a level that virtually all HF communications are wiped out.

Once the CME has passed, it can be several hours or even days before the earth's magnetic field returns to normal and the missing electrons are replaced, allowing higher levels of ionisation to once again occur. A CME travels much slower than a flare and can take a couple of days to reach a distance that will cause disruption to communications.

WHAT IS AN S.I.D.?

An S.I.D. is the abbreviation for SUDDEN IONOSPHERIC DISTURBANCE and occurs as the result of the disturbance to the earth's magnetic field caused by a large solar flare. As the name implies, these events happen suddenly, sometimes within 10 minutes of a large eruption from the sun. An SID only affects the part of the earth that is illuminated (due to the increase in absorption caused by the D region, which disappears after dark) and is often short lived.

The effect on HF communication can be drastic, with signals from everywhere fading from being solid copy to literally disappearing within seconds.

The effect is quite spectacular and a little eerie if you have not experienced an SID before. Sometimes SID's are known as RADIO BLACKOUTS or DELLINGER FADEOUTS. You can expect radio conditions to return to normal, or near normal within an hour or so, except in large events where the disruption can last for several hours.

WHAT IS PCA?

PCA or POLAR CAP ABSORPTION happens as a result of large X class flares, which contain high energy protons (in the order of 10MeV) that are attracted towards the magnetic fields around the polar cap regions of the earth (also known as a solar proton event). The resulting disturbance to the earths magnetic field around the polar regions leads to an increase in absorption (caused by the D and E layers increasing in density), making communications paths that cross near or over the poles almost impossible.

Signals that pass the poles tend to gain a noticeable 'flutter' as the magnetic field density is different, and the level of absorption varies rapidly, this phenomena is known as POLAR FLUTTER and has a sound that is distinctive enough to easily identify a signal propagated by this mode. Because a PCA event affects both the D and E layers, the disturbance to communications can last for days.

WHAT IS AURORA?

AURORA is a phenomena associated with high levels of solar activity.

Visibly, aurora is known as the Northern Lights (in the Northern Hemisphere) or, to give it the proper name, Aurora Borealis. In the Southern Hemisphere, the phenomena is known as the Southern Lights or Aurora Australis. Seeing the Northern lights is an awe inspiring sight and can be spectacular during intense events. In radio terms, an auroral event causes excitement amongst VHF operators who can make contact with stations that are at distances well beyond their normal capability.

A visible aurora requires much less energy than a 'radio' aurora. If an aurora is visible, it doesn't necessarily follow that there will be a radio event. Although it needs to be dark to see an aurora, they can occur at any time of the day and most radio auroras start in the afternoon, last for an hour or two before fading out and then return for a second period around midnight. Some stronger ones have a 3rd period of activity the following morning. If you notice a radio aurora, make a note of the date and check back 27 days later - you will probably find another one in progress!

This is due to the sun making a complete rotation in 27 days, so the part of the sun that was causing the aurora will be in the same position 27 days after the first aurora was noticed. If the event was particularly intense, a check after another 27 days may well see another, weaker, event. Aurora is caused by intense ionisation in the upper atmosphere due to the ionosphere being bombarded with electrically charged particles.

When a large solar flare occurs, huge amounts of plasma and other material are thrown towards the earth. When this material enters the ionosphere, the friction developed by the material moving through the various gases causes a heating effect, which in turn causes light of varying wavelengths. This light is the Aurora Borealis! Different gases give off different colours when they are excited by the bombardment of extra-terrestrial materials. Oxygen at about 60 miles up gives off the familiar green and green/yellow colour, Oxygen at higher altitudes (about 200 miles above us) gives the all red auroras. Ionic Nitrogen produces the blue light and neutral Nitrogen gives off a red-purple glow and is responsible for the rippled edges.

Auroral events are confined to higher latitudes, normally around the polar regions. Stronger, more intense events can be seen from lower latitudes. In the Southern UK auroral displays are somewhat of a rarity but certainly not unheard of.

The effects of Aurora from a communications point of view are only really noticeable on the VHF bands (although the higher HF bands show the characteristic rasp of a signal that has been propagated by Aurora).

Signals that are propagated by aurora for some reason tend to lose all tonal quality and sound ‘ghostlike’ and raspy. SSB signals are very difficult to read as they sound like raspy, ghostlike whispers. CW is a much better alternative, although the normal tone of about 700-1000Hz is replaced by a hissing click.

WHAT IS SPORADIC E?

SPORADIC E Although Sporadic E (abbreviated to SpE or Es) is normally associated with VHF, it also affects the higher HF bands with effects being noticeable from about 21MHz. Sporadic E is the term used to describe extremely intense ionisation of the E layer of the ionosphere. As the name suggests, sporadic E does not follow a set of rules and occurs without warning.

There is a sporadic E ‘season’, where the chances of an occurrence are more likely. This season lasts from May to September, with a shorter season sometimes occurring around the end of the year. Sporadic E is very localised, so much so that a station on one side of a town may be experiencing an opening, while a station located on the other side of the town can hear nothing. Sporadic E moves around in highly ionised ‘clouds’, so it pays to be patient, especially if someone near you is working Es as your turn may well come soon.

Signals propagated by Es tend to be very strong and in the range of 1000-2500km.

Rarely, double hop Es occurs where the signal bounces down from the sporadic E cloud and returns to find a second cloud before finally resting at the receiver, so the signal can be propagated upto about 5000km.

Sporadic E affects the higher HF and lower VHF bands. Sporadic E has been recorded upto about 250MHz, but this is extremely rare. In the UK, for every Es season, only 3 or 4 days will see ionisation strong enough to provide contacts on 144MHz. At 50MHz, Es can be heard most days of the season. A typical Es event on 50MHz would last from a few minutes to a few hours, depending on the intensity of the cloud.

The origin of sporadic E is still not fully understood and there are numerous theories in circulation.

One theory that seems to work is that sporadic E will occur near to an area that has recently experienced a violent electrical thunderstorm. My guess would be that the lightening produces ionisation of the lower atmosphere, some of which finds it’s way up into the E layer.

WHAT IS BACKSCATTER?

BACKSCATTER is a mode of propagation that allows you to hear a signal that would be inaudible when propagated via ‘normal’ methods. The scatter signal comes from a signal that is propagated along a path that would make the signal fall within your skip zone (i.e. the area that is beyond ground wave and not far enough away to allow reception of the first ionospheric bounce), the signal is then ‘scattered’ to an area that IS audible to you. Signals propagated by this mode tend to be weak and ‘hollow’ sounding with some distortion.

If you tune the HF bands and hear a weak, hollow signal from a fairly local station then you will be hearing them by backscatter. It is difficult to know whether you will be able to make contact as they may not be hearing YOU via backscatter.

WHEN WILL THE BANDS OPEN TO THE DESIRED TARGET AREA?

The answer to this question is quite involved as there are many variables to be considered but a few well known properties of each band can give us at least a rough guide as to what countries may be heard at a particular time of day. This is only a guide and is dependant on such things as time of year, solar activity and the capability of your own station. It would be unreasonable to expect a station running low power and indoor antennas to hear and work the same amount of stations as a high power station with large outdoor antennas. However, do not be put off as you will hear and work many stations although you may need to pay more attention to your operating skill and take full advantage of the conditions as previously mentioned. A better equipped station will probably hear stations on a band before you and will be able to hear them after they have faded at your station, so make full use of the time that you are able to hear them!

Propagation though is a great leveller and understanding how the bands respond at different times of the day and year will tip the scales in your favour.

~Internet

Weather radar in Rainbow, Western Victoria, goes online

A gaping hole in the national weather radar network has finally been filled, with the Bureau of Meteorology's new installation at Rainbow in western Victoria going online.

The region has long been considered a black hole for weather radar, because the nearest stations — in Mildura and Mount Gambier — are too far away to provide accurate data on approaching rain.

This meant farmers in one of the country's most productive farming regions were making costly decisions without the information they needed. Work on the radar began in 2018 after years of campaigning by local farmers and the Wimmera Development Association. Farmers need to know when rain is approaching so they can best judge when to spray and fertilise their crops. If rain is on the way, spraying will be held off as chemicals won't be effective. If rain is approaching, fertiliser is put out to be activated.



The weather station features state-of-the-art Doppler radar technology



Modern farming needs data. The new radar covers much of western Victoria.

The new radar plugs a gap in the radar network between Mount Gambier and Mildura.

~Internet



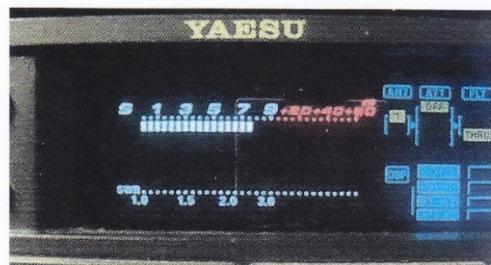
Helping Amateur Radio Operators to resolve interference issues

RASA has launched its new knowledge base website dedicated to the location and minimisation of radio interference.

The new website address is simply **qrm.guru**

We recognise that one of the greatest challenges to Amateur Radio today is the vast increase of noise sources from LED lighting, consumer goods, utility suppliers and solar installations.

The site contains a comprehensive collection of interference location tricks, case studies, contact points, videos and template forms that are all tools to resolve a wide range of interference problems.



The website uses a dynamic Knowledge Base format where questions and key words can be used to show relevant articles and documents.

It is an interactive site that invites Radio Amateurs to tell their own stories and experiences, so that they may help others.

Tips are provided on how to work with your neighbours, utility companies, ombudsman and the National regulator to resolve issues.

Positive experiences about interference free products and equipment installers are also showcased for operators who are yet to make choices that could affect them.

Operators have put a lot of time effort and money into obtaining their license, erecting antennas and purchasing equipment, then discover that nearby noise sources make large parts of the spectrum unusable. It is not ok to simply accept such limitations to our hobby.



This initiative sponsored by the Radio Amateur Society of Australia is aimed at reversing the interference trend and winning back access to the Amateur Radio bands.

BEING HEARD IS IMPORTANT

One evening a grandson was talking to his grandmother about current events.
The grandson asked his grandmother what she thought about the shootings at schools, the computer age, and just things in general.

The Grandmother replied, "Well, let me think a minute,

I was born before:

television
penicillin
polioshots
frozenfoods

Xerox
contactlenses
Frisbees and
the pill

There were no:

credit cards
laser beams or
ball-pointpens

Man had not yet invented:

pantyhose
air conditioners
dishwashers
clothes dryers

clothes were hung out to dry in the fresh air
and man hadn't yet walked on the moon

Your Grandfather and I got married first, and then lived together.

Every family had a father and a mother.

Until I was 25, I called every man older than me, "Sir."

And after I turned 25, I still called policemen and every man with a title, "Sir."

We were before gay-rights, computer-dating, dual careers, daycare centers, and group therapy.

Our lives were governed by the Ten Commandments, good judgment, and common sense.

We were taught to know the difference between right and wrong and to stand up and take responsibility for our actions.

We thought fast food was what people ate during Lent.

Having a meaningful relationship meant getting along with your cousins.

Draft dodgers were those who closed front doors as the evening breeze started.

Time-sharing meant time the family spent together in the evenings and weekends — not purchasing condominiums.

We never heard of FM radios, tape decks, CD's, electric typewriters, yogurt, or guys wearing earrings.

We listened to Big Bands, Jack Benny, and the President's speeches on our radios.

If you saw anything with 'Made in Japan' on it, it was junk.

The term 'making out' referred to how you did on your school exam.

Pizza Hut, McDonald's and instant coffee were unheard of.

We had 5 & dime stores where you could actually buy things for 5 and 10 cents.

Ice-cream cones, phone calls, rides on a streetcar, and a Pepsi were all a nickel.

And if you didn't want to splurge, you could spend your nickel on enough stamps to mail 1 letter and 2 postcards.
You could buy a new Ford Coupe for \$600, but who could afford one? Too bad, because gas was 11 cents a gallon.

In my day:

"grass" was mowed,

"coke" was a cold drink,

"pot" was something your mother cooked in and

"rock music" was your grandmother's lullaby.

"Aids" were helpers in the Principal's office,

"chip" meant a piece of wood,

"hardware" was found in a hardware store and

"software" wasn't even a word.

We were the last generation to actually believe that a lady needed a husband to have a baby.

We volunteered to protect our precious country.

No wonder people call us "old and confused" and say there is a generation gap. How old do you think I am?

Pretty scary if you think about it and pretty sad at the same time.

This woman would be only 68 years old.

She would have been born in 1952.

This is Wilson. He is now working from home



This lockdown makes my home seem like a Casino...

Were loosing money fast,

Drinking cocktails at any hour of the day is the new norm,

And no one knows what day or time it really is

**Saw a radio for sale for \$5, with a broken volume control.
I couldn't turn it down.**

**A guy walks into a radio store.
He then says, "Mate, there are so many stereo-types."**

Husband: My wife is missing. She went shopping yesterday and has not come home!

Officer: Age?

Husband: I'm not sure. Somewhere between 50 and 60. We don't do birthdays.

Officer: Height?

Husband: I'm not sure. A little over five-feet tall.

OFFICER: Weight?

Husband: Don't know. Not slim, not really fat.

OFFICER: Colour of eyes?

Husband: Sort of brown I think never really noticed.

OFFICER: Colour of hair?

Husband: Changes a couple times a year. Maybe dark brown now. I can't remember.

OFFICER: What was she wearing?

Husband: Could have been pants, or maybe a skirt or shorts. I don't know exactly.

OFFICER: What kind of car did she go in?

Husband: She went in my truck.

OFFICER: What kind of truck was it?

Husband : A 2017, manufactured September 16th, pearl white Ram Limited 4X4 .with 6.4l Hemi V8 engine ordered with the Ram Box bar and fridge option, led lighting, back up and front camera, Moose hide leather heated and cooled seats, climate controlled air conditioning. It has a custom matching white cover for the bed, Weather Tech floor mats. Trailing package with gold hitch, sunroof, DVD with full GPS navigation, satellite radio, Cobra 75 WX ST 40-channel CB radio, six cup holders, 3 USB ports, and 4 power outlets. I added special alloy wheels and off-road Toyo tires. It has custom retracting running boards and under-glow wheel well lighting.

At this point the husband started choking up.

OFFICER: Take it easy sir, we'll find your truck

